Steve's Scanner Shop

Tracking Emergency Beacons

By Steve Donnell

Besides Amateur Radio and scanning, one additional area of radiorelated activity that we have pursued for nearly the past fifteen years is our membership in Civil Air Patrol. Initially our primary interest was primarily in helping to provide communications on the HF ad VHF frequencies assigned to CAP, in support of the various Search and Rescue as well as Disaster Relief missions that CAP provides as the Auxiliary of the US Air Force.

As a radio operator with CAP we have often functioned as the central point of contact between mission Command Staff at Head Quarters and various units in the field, both on the ground and in the air. Since CAP also works very closely with various State and Federal agencies, we have had the opportunity to get a close up view of communications facilities in places such as (NH) Office of Emergency Management(Civil Defense). Several years ago, as a large hurricane threatened the New England coast we spent the night at the FEMA Regional Command Center(bunker) in Maynard, MA.

One other area of activity within CAP that we have found to be extremely challenging, and fun, is with tracking of emergency beacons known as ELTs(Emergency Locating Transmitter) and EPIRBs(Emergency Position Indicating Radio Beacons). ELTs are the emergency transmitter beacons installed in most aircraft, including even some "ultralights". EPIRBs are installed in many boats, particularly those used for commercial purposes, such as fishing or carrying charter passengers. Both of types of these beacons operate on a frequency of 121.500 MHz.

One all to common problem with both types of beacons is their tendency to activate accidently. Statistically, over ninety percent of all beacon activations were for nonemergency andaccidental reasons. Which seems to match what we have seen in our own experience; in many years of tracking beacons we have(thankfully) only been involved in a few missions that started out as, or ended up, in locating a known to be missing aircraft(or boat).

Despite the very low chance of encountering any serious emergency we still have approach any Direction Finding(DF)search mission as though it were a real emergency. Part of the reasoning behind this is that the presence of a beacon signal could potentially mask the presence of an actual distress call. Given the possibility of encountering an injured person(s), CAP Ground Search personnel receive training in emergency First Aid and CPR, in addition to training in areas such as survival skills and map reading. As I often try to remind those who I help train to do Ground DF: When you go out on a mission, you simply never know as to WHAT you are going to find, or WHERE you may end up going.

I guess that is part of what it takes in order to "get into" doing Ground DF mission work; you have to enjoy solving mysteries and have some degree of persistence to see it to a conclusion. I also tend to like to view beacon DFing as a "technical" challenge as well.

Usually we seem to average five to six DF missions per year, and while I hesitate to call any mission "typical", this past July was a fairly busy period for us. The profiles of these particular missions range from the sort that we have seen many times before, to the highly unusual: Over the July 4th weekend , we had not just one but two missions. One started out fairly typically, we got a call one of the Command Staff officers who had been notified by AFRCC(AirForce Rescue Coordination Center)that the SARSAT satellite, which monitors for 121.500 beacons, had picked up the signal from a beacon in my area, about ten miles north. We promptly headed out the door, and headed toward the location given for the signal.

We stopped and took a couple of DF "readings", attempting to see if we could pick up any faint signals, but could not even as we expanded our original search area. This was not entirely any surprise, as the accuracy of the location data supplied by the SARSAT can vary widely; sometimes it's accurate to within three to five miles. Other times it can be off by twenty to thirty miles or more. It has improved in recent years, but is still not much more than a general "bench mark" indicator. In many other instances, the satellite won't "hear" a beacon that is still quite active.

We were informed by the Incident Commander for this mission, that a CAP airplane had been launched and was headed in our direction to try and help us. This was a welcome addition as an aircraft flying at typically three thousand feet would easily pickup any beacons within twenty miles or more away, where on the ground the range at which we could typically pick up a beacon signal(which are usually around one hundred milliwatts of power) is only about three to five miles at the most. We were also able to make contact with another CAP member who was available and decided to come along to assist us.

A short time later, the search aircraft neared our location and started to pick up a weak beacon signal. It was quickly apparent that the signal was not in our initial search area, but seemed to be coming from someplace on the coast. We headed in that general direction, already mindful from past experiences, of the likely possibilities which included two small airports and several boat marinas.

Initially the DF track the aircraft had on the signal made it appear as though it was coming from this small airport. Part of what made this all the more likely was due to some extra activity at the airport in the form of a "flyin", where pilots and other aviation fans meet at an airport. However, we were not able to pick up any beacon signals as we neared the airport. About this same time, the crew in the search aircraft received additional information from the Commander that a possible source for the signal could be due to the crash of a small plane near an airport about ten miles south, just over the border in Massachusetts.

CAP in Massachusetts had not been activated as there had been no real need for a "search" as the crash occurred in a near a populated area, and had been witnessed as it happened. There was however one serious problem: If there was a beacon going off from that aircraft, it could be easily blocking reception(by the SARSAT satellite) of a different signal in our area. We were instructed by the mission Commander to proceed to the crash site, and if possible, secure the beacon.

The search aircraft, easily located the crash scene. It was in a marsh, but fairly close to a road. Also, Fire Dept and Rescue vehicles and personnel could be spotted around the site. From the description of the crash location we got a good idea of it's location as we had traveled to this area several times in the past in order to search for, or secure various EPIRB beacons.

When we arrived at the scene, we spoke with the local Fire Chief as well as an FAA representative, who readily agreed to allowing us to secure the ELT in the aircraft. This was a not too easy of as task as we had to walk through some slightly soggy ground in order to reach the aircraft. But what made things even worse was that when the aircraft crashed, it had flipped over on it's roof. With the ELT secured, a more interesting process, began, that of removing the aircraft from the swap. First the aircraft had to be flipped over. To do this, a large tow truck was brought in, and a line attached to the tail of the aircraft, see photos. After the aircraft was pulled out it was placed on the back of a ramp truck. Luckily, both the Pilot and a passenger onboard the aircraft received only minor injuries.

A few weeks later we went out on another search for a beacon signal that turned out to be what I would describe, as the "ultimate EPIRB hunt"(for us, so far). Late one evening we heard radio traffic on the CAP VHF FM radio frequency that seemed to indicate that both Maine and Massachusetts CAP had been activated for some variety of mission most likely a beacon search. I started to wonder as to what the likely hood would be that the source or beacon(if there was one) could be directly in the middle of southern NH where I was located. Part of what prompted my thinking in this direction, was having overheard a couple of reports about an ELT on local air traffic control frequencies earlier in the day.

We headed out, our plan was to drive over to Portsmouth, and then head south along the coast a ways. We didn't get too far before we heard a CAP aircraft from Maine attempting to make contact with a Ground Team somewhere. We made contact with the aircraft and informed him that we were in the area, with DF gear and would be happy to assist then. He told us that he was over Portsmouth and was picking up an ELT signal, somewhere near the Pease (Trade Port)(commercial airport).

When we arrived at the airport, we could not initially detect any beacon signals, however we did pick up a weak signal using our more sensitive DF receiver, and it pointed directly towards Portsmouth Harbor, of which the eastern side bordered the southern tip of Maine. The search aircraft also radioed us with the name and phone number of the Incident Commander from CAP, who was officially in charge of the mission.

As we neared the harbor, the beacon signal got noticeably stronger. Initially, it appeared as though the signal might be coming from a small group of boats tied up along near the bridge that crossed between Portsmouth, NH and Kittery, ME. However in checking further down along the river, we got a much stronger signal. But even more interesting was the DF bearing we got indicated the signal was coming from directly across the river. Although quite dark at the time(about 3AM), I was fairly sure that there were no boats tied up on the Portsmouth side where we were. However, across the river was the Portsmouth Naval Ship Yard. This place wasn't your typical boat marina; it's a major overhaul facility for US Navy nuclear submarines, and is heavily guarded by the US Marines and DOD Police.

We made contact with the Ground Team from Maine CAP(just one guy). When we told him of our findings we decided to go see if we could be permitted access to the shipyard. We arrived at the gate, and spoke to the security supervisor, we were told to "come back Monday". We departed and decided to talk with some folks that would likely be a bit more friendly, namely the US Coast Guard, who would at least have some clue as to what an ELT/EPIRB was.

The local Coast Guard station is located in New Castle, just down river from Portsmouth. We arrived at the station we explained the situation to the Watch Commander. He wasn't aware of any beacons going off in the harbor, but when we took a DF reading from the roof of their observation tower, we could easily pick up the signal, and it pointed directly back up the river towards the shipyard.

The Watch Commander agreed to take us up river in one of their small patrol boats, a twenty two foot "zodiac". We zipped up the river as we rounded a bend, the beacon signal started to get stronger again. Another DF bearing, indicated the signal was definitely coming the direction of the shipyard. From where we were standing in the back of the boat, I couldn't initially see what was tied up at the docks, but as we got closer and turned a bit, I finally saw what my DF antenna had been pointing towards: A large white vessel, with and orange stripe down the bow, the Coast Guard cutter Alliance...

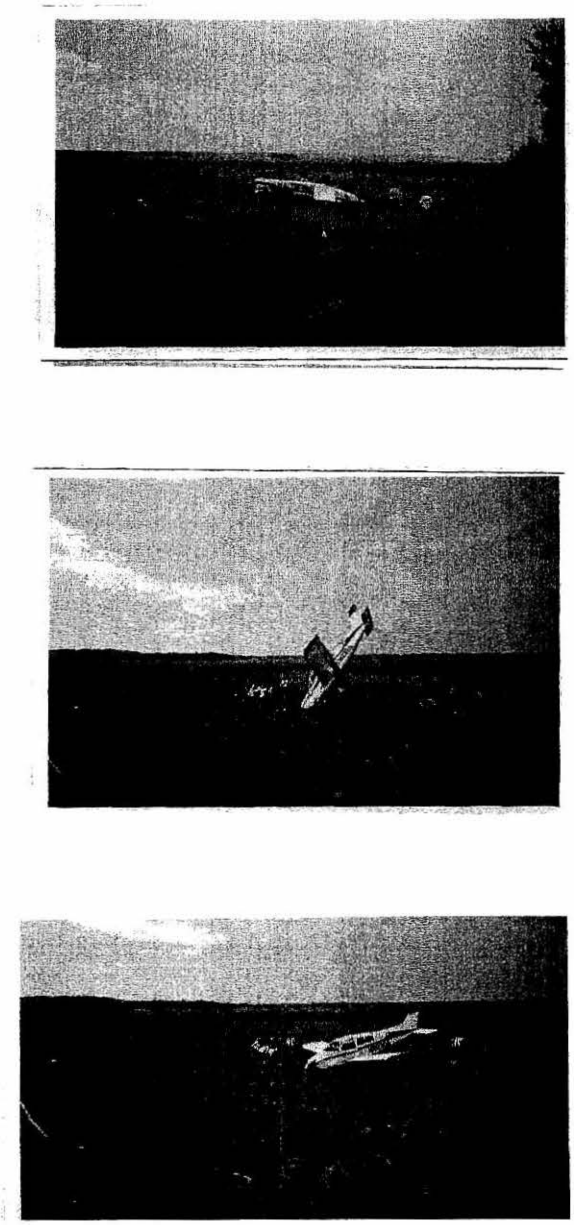
As we carefully came along the side of the Alliance, the crew on the patrol boat attempted to make radio contact with who ever was on watch aboard the Alliance. Short time later, a couple of the crew appeared on deck. We explained to them what we were looking for, and asked that they check any that they had onboard. We would have climbed aboard the cutter to assist, however a suitable ladder couldn't be located to reach the small patrol boat, and the DOD security guys who watched close by, weren't about to permit the patrol boat to tie up at the dock.

A few minutes later, and the beacon went silent. One of the Alliance crew members had located the source of the signal, it was the ship's own EPIRB, an old one made by Acer Electronics. It apparently been moved earlier in the day while the crew had been doing a bit of painting onboard.

While certainly different so far as to the final conclusion, I will add that this was quite "typical" as to what we have seen countless times in tracking beacons which turn out to be EPIRBs; unlike ELTs that are activated by way of a (mechanical)shock sensor switch, many EPIRBs can be set off by simply movement or changing their position. The idea being that the beacon sits in a special "cradle", and if the boat ever sinks or capsizes, the beacon will automatically trigger as it floats free of the boat(with a tether line attached). Unfortunately, all too often people get careless in handling them in the course of performing maintenance, or in storing the beacons. Also quite often the case with older EPIRBs, is that people will not properly "disarm" them(remove) the batteries. This occurs as boaters replace older EPIRBs, with newer ones that now include a digital data burst signal that is transmitted on 406.025 MHz.

In theory, these "new" generation EPIRBs (and will soon include ELTs, of similar design), are great; the 406 data burst consists a special ID number, that is supposed to be registered with whoever owns the beacon, and can also even include lat/lon position data supplied by an external GPS unit. However from what we have seen, they are far from perfect, as in just the past nine months, we have tracked two of these type beacons that were triggered for unknown reasons. In one of these cases, the Coast Guard nor AFRCC, were aware that the beacon was activated.

If you should happen to hear a signal with a "whoop whoop" type sound on 121.500 MHz, don't be alarmed, simply contact your local FAA office or the Civil Air Patrol. If you would be interested in participating in assisting with various types of emergency communications, or in learning how to "DF" emergency beacons, get in touch with your local CAP unit. You can also find additional information online at: **http://www.cap.gov/**



Photos from ELT search to Plum Is, MA